

## ABSTRACT OF THE DISCLOSURE

A method for determining candidates for gene deletions and additions using a model of a metabolic network associated with an organism, the model includes a plurality of metabolic reactions defining metabolite relationships, the method includes selecting a  
5 bioengineering objective for the organism, selecting at least one cellular objective, forming an optimization problem that couples the at least one cellular objective with the bioengineering objective, and solving the optimization problem to yield at least one candidate.